CLARKIA WATER AND SEWER DISTRICT (PWSNO 1400021)
SOURCE WATER ASSESSMENT REPORT

February 26, 2003

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This risk assessment is based on a land use inventory in the well recharge zone, sensitivity factors associated with how the well was constructed, and aquifer characteristics.

This report, *Source Water Assessment for the Clarkia Water and Sewer District*, describes the public drinking water well; the well recharge zone and potential contaminant sites located inside the recharge zone boundaries. This assessment, taken into account with local knowledge and concerns, should be used as a planning tool to develop and implement appropriate protection measures for this public water system. **The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

A single well adjacent to the West Fork of the St Maries River supplies drinking water for the Clarkia Water and Sewer District. The water system serves a residential population of 75 people in an unincorporated town about 35 miles southeast of St. Maries Idaho. The well was drilled in 1994 to replace two substandard sources. A ground water susceptibility analysis DEQ conducted January 9, 2003 ranked the well highly susceptible to microbial contamination because it is only 30 feet from the river. The well's susceptibility to chemical contamination is moderate. Risk factors related to local geology added the most points to the final susceptibility scores.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

Continuing to maintain the wellhead and surface seal in compliance with the *Idaho Rules for Public Drinking Water Systems* is probably the most important drinking water protection available to Clarkia Water and Sewer District. The district should form ground water protection partnerships with landowners in the recharge zone, and help them assess business household or agricultural activities for their potential impact on water quality. The district needs to apply for a waiver from the requirement for a 50-foot radius well lot, and needs to develop a cross connection control ordinance

Due to the time involved with the movement of ground water, source water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. For assistance in developing protection strategies, please contact your regional Department of Environmental Quality office or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR CLARKIA WATER AND SEWER DISTRICT

Section 1. Introduction - Basis for Assessment

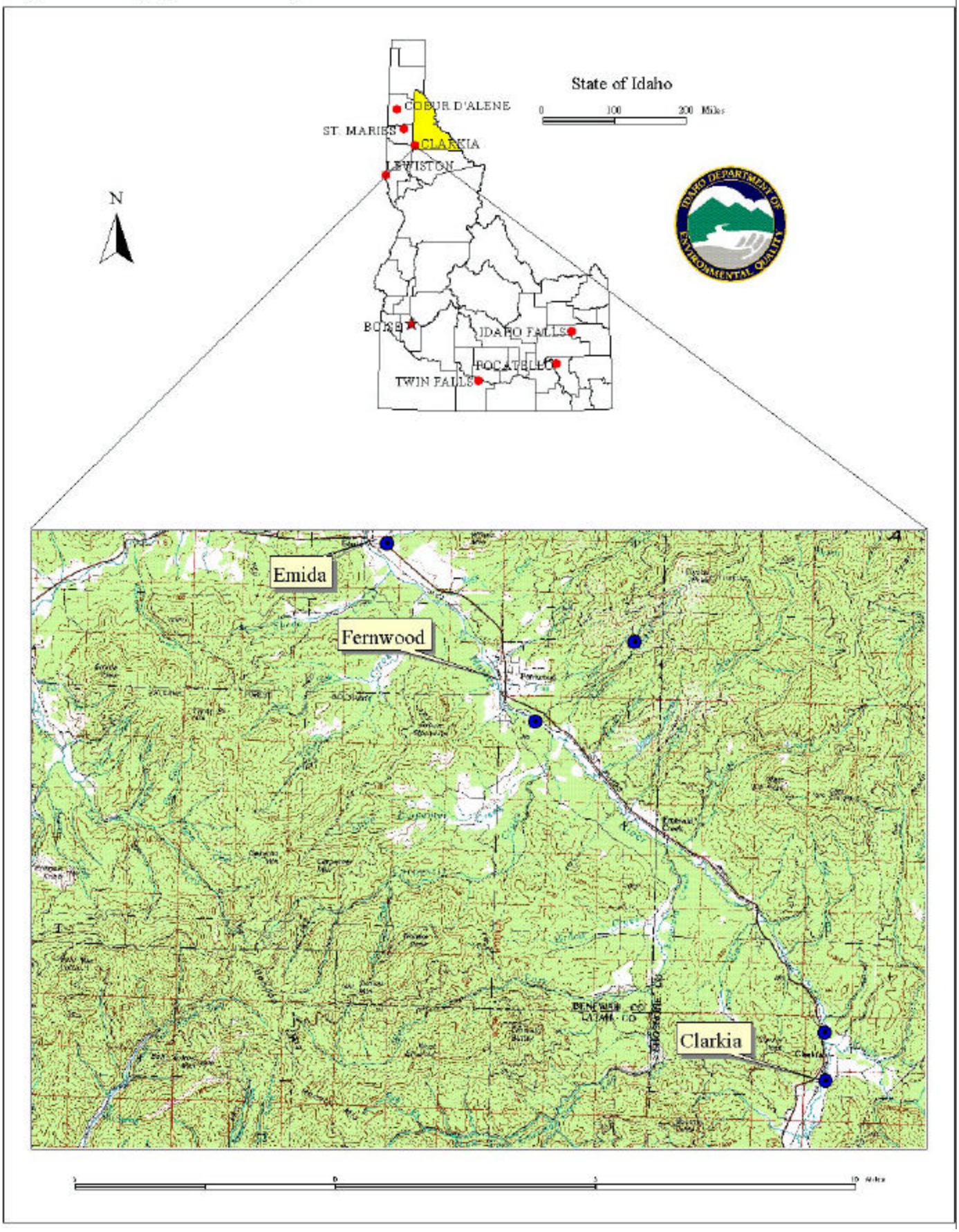
The following sections contain information necessary for understanding how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and an inventory of significant potential sources of contamination identified within that area are included. The ground water Susceptibility Analysis Worksheet used to develop this assessment is attached.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess every public drinking water source in Idaho for its relative susceptibility to contaminants regulated by the Safe Drinking Water Act. These assessments are based on a land use inventory inside the delineated recharge zones, sensitivity factors associated with how the well is constructed, and aquifer characteristics. The state must complete more than 2900 assessments by May of 2003. Because resources and the time available to accomplish assessments are limited, an in-depth, site-specific investigation for every public water system is not possible.

The results of the source water assessment should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system. The ultimate goal of this assessment is to provide data to local communities for developing a protection strategy for their drinking water supply. The Idaho Department of Environmental Quality recognizes that pollution prevention activities generally require less time and money to implement than treating a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a source water protection program should be determined by the local community based on its own needs and limitations. Wellhead or source water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Figure 1. Geographic Location of Clarkia



Section 2. Preparing for the Assessment

Defining the Zones of Contribution - Delineation

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the well recharge area into time of travel zones indicating the number of years necessary for a particle of water flowing through the aquifer to reach a well. The ground water flow model used data DEQ assimilated from a variety of sources including local well logs and pumping volume estimates for the Clarkia Water and Sewer District well.

Clarkia Water and Sewer District operates a community water system with 33 connections serving a population of 75 year round residents in the unincorporated town of Clarkia about 35 miles southeast of St Maries (Figure 1). The population increases to about 200 during the summer. The well is 130 feet deep and produced 80 to 100 gallons per minute during a 24-hour air test at the time of drilling.

With no surrounding well logs to constrain the direction or gradient of the ground water, a fixed radius delineation was calculated for the Clarkia Water and Sewer District well. The calculated fixed-radius method simplifies the delineation of 3-, 6-, and 10-year time-of-travel boundaries (i.e., capture zones) for Idaho's five generalized aquifer types. The radius for each time-of-travel boundary is determined for each generalized aquifer type by referencing pumping rate tables presented in Appendix E of the Idaho Source Water Assessment Plan (IDEQ, 1999), and adjusting them if additional information is available.

Well log formation for the Clarkia well indicated a producing thickness of 20 feet with a porosity value of 0.10. Calculations resulted in circles of radius 890 feet, 1250 feet, and 1620 feet for the 3-year, 6-year, and 10-year time of travels, respectively (Figure 2).

Identifying Potential Sources of Contamination

The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Inventories for all public water systems in Idaho were conducted in two-phases. The first phase involved identifying and documenting potential contaminant sources within a system's source water assessment area through the use of computer databases and Geographic Information System maps developed by DEQ. Maps showing the delineations and tables summarizing the results of the database search were then sent to system operators for review and correction during the second or enhanced phase of the inventory process. Wheat Kruger completed the enhanced inventory for Clarkia Water and Sewer District. Information from the public water system file was also incorporated into the potential contaminant/land use inventory.

Figure 2, *Clarkia Water and Sewer District Delineation and Potential Contaminant Inventory* on page 7 of this report shows the location of the Clarkia Water and Sewer District well, the zone of contribution DEQ delineated for it, and potential contaminant sites in the vicinity. Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. When a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation.

Section 3. Susceptibility Analysis

The susceptibility to contamination of all ground water sources in Idaho is being assessed on the following factors:

- physical integrity of the well,
- hydrologic characteristics,
- land use characteristics, and potentially significant contaminant sources
- historic water quality

The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. A high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. The following summaries describe the rationale for the susceptibility ranking. The Susceptibility Analysis Worksheet for the Clarkia Water and Sewer District well, Attachment A, shows in detail how the well was scored.

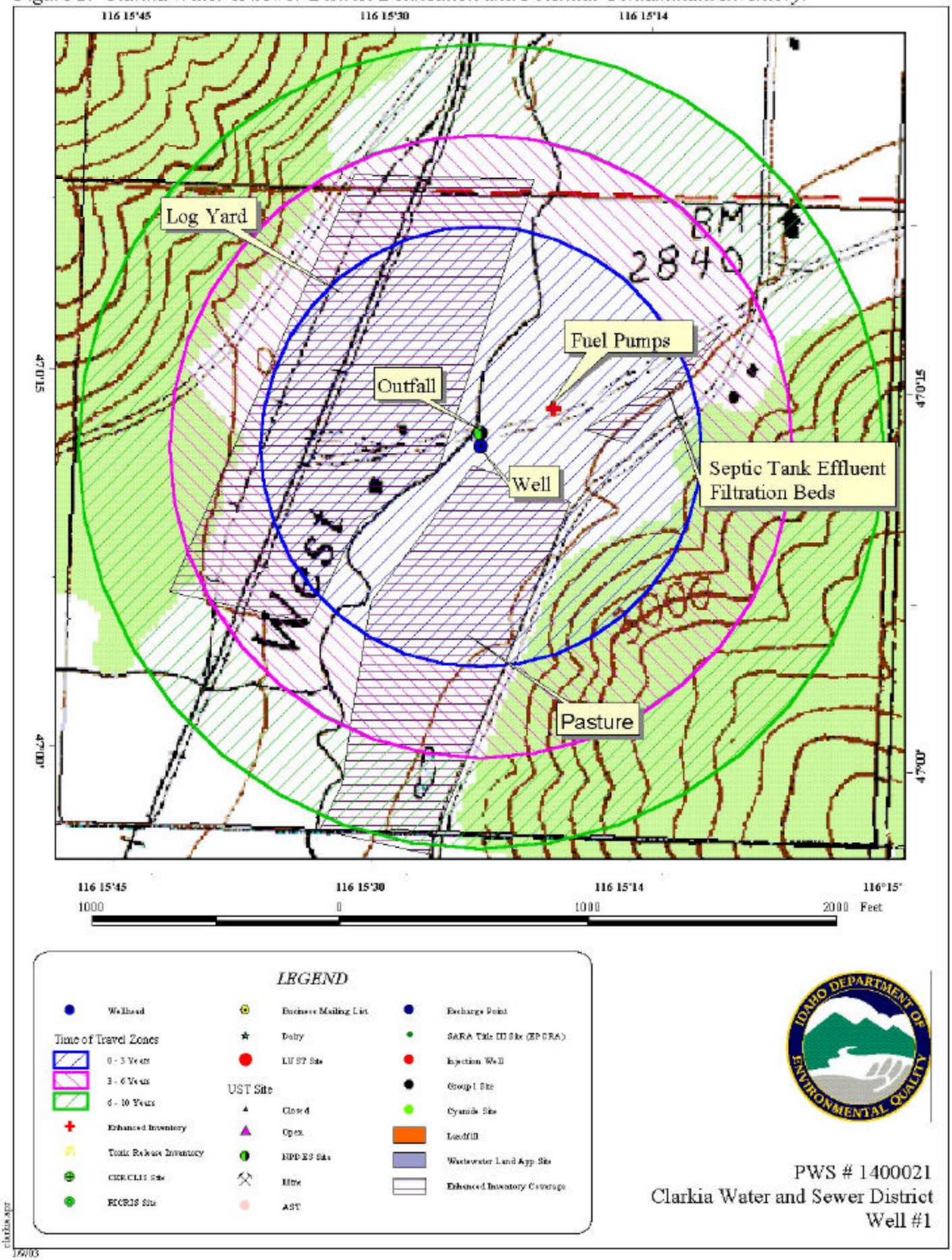
Well Construction

Well construction directly affects the ability of the wells to protect the aquifer from contaminants. Lower scores imply a well that can better protect the water. This portion of the susceptibility analysis relies on information from individual well logs and from the most recent sanitary survey of the public water system. The Clarkia Water and Sewer District well log is on file with DEQ. When the water system was inspected in November 2000 it appeared to be well run and in substantial compliance with the *Idaho Rules for Public Water Systems.* No deficiencies in the wellhead and surface seal maintenance were noted during the survey.

The Clarkia Water and Sewer District well was drilled in 1994 to replace a substandard well and creek source. The well is 130 feet deep with 0.25 gauge steel casing to a depth of 111 feet. The bottom 19 feet of the well are free standing in shale. The well has a 42-foot deep concrete surface seal that penetrates a confining layer of silt lying from 20 to 42 feet below land surface. The well is not screened. Water apparently produced from the shale stratum enters through the bottom of the casing. When the well was developed, the static water level was 7 feet below ground. At times artesian pressure reportedly raises the water to the surface.

The well is located only 30 feet from the West Fork of the St. Maries River and is in the floodplain. The required separation distance between public drinking water wells and surface water is 50 feet (IDAPA 16.01.08).

Figure 2. Clarkia Water & Sewer District Delineation and Potential Contaminant Inventory.



Hydrologic Sensitivity

Hydrologic sensitivity scores reflect natural geologic conditions at the well site and in the recharge zone. Information for this part of the analysis is derived from individual well logs and from the soil drainage classification inside the delineation boundaries. The Clarkia Water and Sewer District well scored 5 points out of 6 points possible in the hydrologic sensitivity portion of the susceptibility analysis.

Soils in the recharge zone generally are moderately well drained. With the exception of 6 feet of clay at the surface, and a bed of silt from 20 to 42 feet, the soil column above the water table is composed of permeable gravel, sand and broken shale. The well log notes the presence of significant amounts of petrified wood from 42 to 67 feet below the surface.

Potential Contaminant Sources and Land Use

Figure 2, *Clarkia Water and Sewer District Delineation and Potential Contaminant Inventory* on page 7 shows the location of the Clarkia Water and Sewer District well, and the calculated fixed radius recharge zone boundaries. The well is about 30 feet east of the river, a potential source of microbial contaminants. IDAPA 16.01.08 specifies a minimum 50-foot separation distance between wells and surface water. The outfall for the septic tank effluent filtration beds about 450 feet east of the well is just upstream from the well location. Potential contaminant sites identified inside the delineated area include a log yard, pasture, septic tank effluent filtration beds, and bulk fuel pumping facilities. In the susceptibility analysis sites closest to the well are scored more heavily than sites further away.

Historic Water Quality

The Clarkia Water and Sewer District well has a good water quality history. The district conducted microscopic particulate analyses in April and October 2001. Scores for both tests were 0, indicating low risk for direct surface water influence. In the past 4 years tests for total coliform were negative every month except March 1998 and October 2000. Bacterial growth in the reservoir due to low water demand during the winter months was likeliest cause of the problem. Chemical sampling results for Clarkia Water and Sewer District are summarized on the table below.

Table 1. Clarkia Water and Sewer District Chemical Sampling Results

Primary IOC Contaminants (Mandatory Tests)							
Contaminant	MCL (mg/l)	Results (mg/l)	Dates	Contaminant	MCL (mg/l)	Results (mg/l)	Dates
Antimony	0.006	ND	10/4/94 through 12/18/01	Nitrate	10	ND	10/4/94 through 12/18/01
Arsenic	0.01	ND	10/4/94 through 12/18/01	Nickel	N/A	ND	10/4/94 through 12/18/01
Barium	2.0	ND to 0.011	10/4/94 through 12/18/01	Selenium	0.05	ND	10/4/94 through 12/18/01
Beryllium	0.004	ND	10/4/94 through 12/18/01	Sodium	N/A	16 TO 22.2	10/4/94 through 12/18/01
Cadmium	0.005	ND	10/4/94 through 12/18/01	Thallium	0.002	ND	10/4/94 through 12/18/01
Chromium	0.1	ND	10/4/94 through 12/18/01	Cyanide	0.02	ND	10/4/94
Mercury	0.002	ND	10/4/94 through 12/18/01	Fluoride	4.0	0.5 TO 3.6	10/4/94 through 12/18/01

Secondary and Other IOC Contaminants (Optional Tests)			
Contaminant	Recommended Maximum (mg/l)	Results (mg/l)	Dates
Manganese		0.04	1/18/95
Iron		0.28	1/18/95

Regulated and Unregulated Synthetic Organic Chemicals		
Contaminant	Results	Dates
29 Regulated and 13 Unregulated Synthetic Organic Compounds	None Detected Except As Listed Below	10/4/94, 12/19/01

Regulated and Unregulated Volatile Organic Chemicals		
Contaminant	Results	Dates
21 Regulated And 16 Unregulated Volatile Organic Compounds	None Detected	10/4/94, 12/14/98

Radiological Contaminants			
Contaminant	MCL	Results	Dates
Gross Alpha, Including Ra & U	15 pC/l	0.5 to 1.3 pC/l	9/27/94 through 11/22/99
Gross Beta Particle Activity	4 mrem/year	1.8 to 2.3 mrem	9/27/94 through 11/22/99

Final Susceptibility Ranking

The Clarkia Water and Sewer District well automatically ranked highly susceptible to microbial contamination due to its flood plain location 30 feet from the West Fork of the St Maries River. Susceptibility to other classes of regulated contaminants is moderate. Risk factors related to local geology added the most points to the final susceptibility scores. Total scores for system construction and hydrologic sensitivity along with the cumulative scores for land use and potential contaminant sites are shown on Table 2. The complete Susceptibility Analysis Worksheet for the Clarkia Water and Sewer District well are found in Attachment A.

The final scores for the susceptibility analysis were determined using the following formulas:

- VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (PCI & Land Use x 0.2)
- Microbial Final Score = Hydrologic Sensitivity + System Construction + (PCI & Land Use x 0.35)

The final ranking categories are as follows:

- 0 - 5 Low Susceptibility
- 6 - 12 Moderate Susceptibility
- > 13 High Susceptibility

Table 2. Summary of Clarkia Water and Sewer District Susceptibility Evaluation

Cumulative Susceptibility Scores						
Well Name	System Construction	Hydrologic Sensitivity	Contaminant Inventory			
			IOC	VOC	SOC	Microbial
Well #1	2	5	10	10	9	*High

Final Susceptibility Score/Ranking				
	IOC	VOC	SOC	Microbial
Well #1	9/Moderate	9/Moderate	8/Moderate	*High

IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical
*High due to presence of surface water in sanitary setback zone.

Section 4. Options for Source Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

Results of microscopic particulate analyses in April and October 2001 indicate that a hydraulic connection between the Clarkia well and the West Fork is unlikely. While it is unfortunate that the well was drilled on a floodplain when the system was reconstructed in 1994, the clay and silt strata in the soil column provide some protection against the vertical transport of contaminants from the surface to the ground water. Additionally, the well casing was extended so that its top is two feet above the historic high water level. The November 2000 sanitary inspection report says the district needs to apply for a waiver from the requirement for a 50-foot radius well lot. A voluntary measure the district should consider is fencing the portion of the well lot under its ownership to keep grazing cattle as far as possible from the well head. Continuing to maintain the well to ensure the integrity of the wellhead and surface seal is probably the most significant drinking water protection tool available to Clarkia Water and Sewer District.

The district should form ground water protection partnerships with neighboring landowners and businesses. The Groundwater Foundation and the Environmental Protection Agency websites provide industry specific guidance for water protection practices. Managing fuel storage facilities, vehicle maintenance sites, or livestock and wildlife waste to prevent ground water contamination are pertinent topics in the Clarkia well recharge area.

Assistance

Public water suppliers and users may call the following IDEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the IDEQ office for preliminary review and comments.

Coeur d'Alene Regional DEQ Office	(208) 769-1422
State IDEQ Office	(208) 373-0502
Website:	www.deq.state.id.us/water/water1.htm

Water suppliers serving fewer than 10,000 persons may contact Melinda Harper of the Idaho Rural Association (208)343-7001 for assistance with drinking water protection plans. www.idahoruralwater.com

References Cited

Freeze, R.A., and J.A. Cherry, 1979, Groundwater, Prentice-Hall, Inc., 604 p.

Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 1997. "Recommended Standards for Water Works."

Idaho Department of Environmental Quality, 1997. Design Standards for Public Drinking Water Systems. IDAPA 58.01.08.550.01.

Idaho Division of Environmental Quality, 1999, Idaho Source Water Assessment Plan, October, 39 p.

Idaho Division of Environmental Quality, 1997, Idaho Wellhead Protection Plan, Idaho Wellhead Protection Work Group, February.

Idaho Department of Water Resources, 1993. Administrative Rules of the Idaho Water Resource Board: Well Construction Standards Rules. IDAPA 37.03.09.

Theis, C.V., 1935, The Relation between Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage, Trans. Amer. Geophysical Union, v. 16, pp. 519-524.

Attachment A

Clarkia Water and Sewer District
Susceptibility Analysis Worksheet

Ground Water Susceptibility

Public Water System Name : **CLARKIA WATER AND SEWER DIST** Source: **WELL #1**

Public Water System Number : **1400021** 1/9/03 11:20:00 AM

1. System Construction		SCORE			
Drill Date	5/23/94				
Driller Log Available	YES				
Sanitary Survey (if yes, indicate date of last survey)	YES 2000				
Well meets IDWR construction standards	NO	1			
Wellhead and surface seal maintained	YES	0			
Casing and annular seal extend to or through low permeability unit	YES	0			
Highest production 100 feet below static water level	YES	0			
Well located outside the 100 year flood plain	NO	1			
Total System Construction Score		**2**			
2. Hydrologic Sensitivity					
Soils are moderately drained	YES	1			
Vadose zone composed of gravel, fractured rock or unknown	YES	1			
Depth to first water > 300 feet	NO	1			
Aquitard present with > 50 feet cumulative thickness	NO	2			
Total Hydrologic Score		**5**			
		IOC	VOC	SOC	Microbial
3. Potential Contaminant / Land Use -Near Well		Score	Score	Score	Score
Land Use	Agricultural, Industrial, Municipal Service	1	1	1	1
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Sanitary Setback	YES. Well 30 feet from surface water	NO	NO	NO	YES
Total Potential Contaminant Source/Land Use Score Near Well		**1**	**1**	**1**	**1**
Potential Contaminant / Land Use - 3 YR TOT					
Contaminant sources present (Number of Sources)	YES. Log yard, fuel pumps, pasture, gray water filter	2	2	1	1
(Score = # Sources X 2) 8 Points Maximum		4	4	2	2
Sources of Class II or III leacheable contaminants or Microbials	YES	2	2	1	
4 Points Maximum		2	2	1	
3 YR TOT contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use 3 YR TOT	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - 3 YR TOT		**6**	**6**	**3**	**2**
Potential Contaminant / Land Use - 6 YR TOT					
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or Microbials	YES	1	1	1	
Land Use 6 YR TOT	Less than 25% Agricultural Land	0	0	0	
Potential Contaminant Source / Land Use Score - 6 YR TOT		**3**	**3**	**3**	**0**
Potential Contaminant / Land Use - 10 YR TOT					
Contaminant Source Present	NO	0	0	0	
Sources of Class II or III leacheable contaminants or Microbials	NO	0	0	0	
Is there irrigated agricultural lands that occupy > 50% of Zone	NO	0	0	0	
Total Potential Contaminant Source / Land Use Score -10 YR TOT		**0**	**0**	**0**	**0**
Cumulative Potential Contaminant / Land Use Score		**10**	**10**	**7**	**3**
4. Final Susceptibility Source Score		**9**	**9**	**8**	**8**
5. Final Well Ranking		Moderate	Moderate	Moderate	***High**

***High due to presence of surface water within 50 feet of wellhead.**

POTENTIAL CONTAMINANT INVENTORY
List of Acronyms and Definitions

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as ? Superfund? is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RICRIS – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water assessment area.